Earth Systems
Environmental Engineering

January 7, 2021

Via Email/Sharefile

Mr. Andrew Park
Hazardous Waste Programs Branch
US Environmental Protection Agency Region 2
290 Broadway, 22nd Floor
New York, New York 10007-1866

Re: Well Manual Response to Comments (October 19, 2020 Comments)
Hess Corporation Former Port Reading Complex (HC-PR)
750 Cliff Road
Woodbridge, Middlesex County, New Jersey
NJDEP PI# 006148
ISRA Case No. E20130449
EPA ID No. NJD045445483

Dear Mr. Park:

Earth Systems, Inc. (Earth Systems) has prepared this letter on behalf of Hess Corporation (Hess) regarding the comments provided by the New Jersey Department of Environmental Protection (NJDEP) relating to the Well Manual submitted on July 31, 2020. A revised Well Manual has been included with this response. As explained below, some wells are currently under evaluation. The Well Manual will continue to be revised and updated, as necessary, and included with all future report submittals.

Regarding NJDEP comments related to the actual collection of groundwater samples, Earth Systems has been certified as a laboratory (ID #13040) by the NJDEP Office of Quality Assurance (OQA) since 2016 for analyze immediately parameters. As part of the certification, Earth Systems is audited every 3 years by the NJDEP OQA. The initial certification and subsequent audits include the review of Earth Systems' Standard Operating Procedures (SOPs), field sampling worksheets, groundwater sampling methods, and Proficiency Test sample results. In addition to being certified and audited by the NJDEP OQA, the NJDEP Hazardous Waste (HW) Operation and Maintenance (O&M) team conducted a field audit in October 2017 of Earth Systems' groundwater sampling procedures. NJDEP O&M personnel observed the collection of quarterly

groundwater samples from the monitoring wells associated with the 3 landfarms and no violations were found. A copy of the inspection summary report is included with this letter as **Appendix A**.

NJDEP Comments & Earth Systems/Hess Responses

NJDEP Comment 1: Well Location Map:

- Include a site wide well location map with each volume.
- Include a well location map for each AOC.

Earth Systems/Hess Response 1: A well location map has been added to the revised Well Manual folder. The well location map also includes the location of all Site AOCs. The well map will continue to be updated as monitoring wells are either abandoned or added. A well location map has historically been included, and will continue to be included, with all report submittals.

NJDEP Comment 2: Well name/ID:

- Some well names need to be clarified, e.g., MW-1, MW-2, MW-3, MW-4 installed at AOC 19/QC Lab need to be identified in the table as AOC 19 or QC Lab wells.
- Suggestion: table and volumes divided into sections based on AOC Name.

Earth Systems/Hess Response 2: The majority of site well names reflect the AOC they are associated with investigating. For example, the truck loading rack monitoring wells all begin with the preface "TR.". The only wells that do not have an AOC specific name are the monitoring wells associated with the QC laboratory. A column has been added to the well summary spreadsheet which identifies the AOC associated with each monitoring well and reflects this naming protocol. The spreadsheet can be sorted by this column.

NJDEP Comment 3: DTB from TOC: Specify that this column is based on the well construction record (total casing length and screen length).

Earth Systems/Hess Response 3: The column heading has been revised to reflect that the value is obtained from the well construction record.

NJDEP Comment 4: Gauged Depth of Well TOC: This column was in a prior Well Construction Summary Table (WCST), including gauging data and date. The column was omitted from the updated/ revised WCST.

- Include this column. It is an important "line of evidence" to support construction information and where there are any differences that need to be resolved, where maintenance is needed, etc.
- Re-gauging all wells is recommended to determine current TD TOC, or confirm data from prior gauging.

Earth Systems/Hess Response 4: The "Gauged DTB" column has been added back to the well summary spreadsheet. All monitoring wells were gauged between November 5

and 6, 2020 and the new gauging data was compared to the data supplied in the Well Manual summary spreadsheet. The November 2020 gauging observations/data are consistent with data utilized for the groundwater flow maps that have been included in previous submittals and have been included in the revised Well Manual.

NJDEP Comment 5: Casing Length: The casing length determines the top of the well screen. Where surveyed casing AGS is less, or more, than described on well documentation (typically as +3", +2.5' etc.), it may reflect that the well screen interval is set slightly deeper or shallower in the borehole. It may also be that the casing measurement wasn't exact when constructed, or the well was modified after construction.

- Accurately determining the Top of Screen from TOC is important for low flow sampling and determining pump intake depth from TOC.
  - Water table well pump placement must consider: 1) DTW TOC and 2) Top of Screen (TOS) from TOC. Pump placement must be adequately set below both.
  - Deeper wells must identify the Top of Screen from TOC to ensure pump is set within the screen interval and not too close to the Top of Screen. Pump intakes should target the midpoint of 5' screen intervals (2.5' below TOS).

Earth Systems/Hess Response 5: The placement of the pump during low flow groundwater sampling is always based on well construction details and the gauged depth to water measurement. As explained above, all monitoring wells were gauged between November 5 and 6, 2020 and the new gauging data was compared to the data supplied in the Well Manual summary spreadsheet. The pump placement depth is always noted on the groundwater sampling low flow field worksheets that are included with all report submittals. In addition to these worksheets, a summary table will also be included in future reports that will document well construction details, gauged groundwater depths, and pump placement depth.

NJDEP Comment 6: Geologist Logs: Try to locate missing geologist boring logs.

- EnviroTrac logs may be in the quarterly report that the well was installed in, or in the 4th Quarter Progress Report of the year the well was installed. Earth Systems period geologist logs may be similarly located.
- Geologist boring logs typically provide more detailed descriptions of subsurface materials then well construction record boring logs, as well as contamination observations and field screening readings.
- In some locations, evidence of contamination or transmissive zones within the screen interval may be used to targeted low flow sample depths.

Earth Systems/Hess Response 6: The requested soil boring logs have been added to the Well Manual. A review of historic quarterly reports has been conducted to locate as many boring logs as possible. However, in some cases older boring logs could not be located. We will continue to attempt to locate any missing boring logs by reviewing additional historic reports. The summary table has been revised to include a column stating whether a soil boring log was located and included in the Well Manual.

NJDEP Comment 7: Decommissioning Documentation: Well locations with missing decommissioning documentation will need to be resolved with the Bureau of Water

Supply and Well Permitting.

Earth Systems/Hess Response 7: Earth Systems/Hess has submitted several well search requests to the Bureau of Water Supply and Well Permitting throughout the site investigation and remedial investigation phases of the project. Earth Systems/Hess will continue to work with the Bureau of Water Supply and Well Permitting to resolve any missing decommissioning documentation. As decommissioning documentation is obtained, the Well Manual will be updated.

NJDEP Comment 8: Well Modifications:

- Ensure construction of all modified wells is accurately reflected in all columns of the table.
- Where a well modification is identified or suspected (below), additional information/evaluation may be needed.

Earth Systems/Hess Response 8: Well construction information has been verified on the summary table and additional information added for clarity.

NJDEP Specific Well Comments: Volume 1 & 2 Well Information and Well Construction Summary Table

The NJDEP provided specific comments on all wells included in the Well Manual. A copy of the NJDEP comments and Earth Systems/Hess' notes are included in **Appendix B**. In most cases, the comments pertained to a difference in the gauged depth of the well in comparison to the well record. Based on the NJDEP comments, a comprehensive well gauging effort was completed in November 2020 and several wells (referenced below) were newly evaluated by a licensed well driller and will either be redeveloped, reinstalled, abandoned, or a determination made whether silt accumulation in the well (in cases where this is an issue) influences the data quality objectives of sampling the well. Please note that a certain accumulation of silt in a monitoring well is common and expected over time. Monitoring wells are routinely evaluated to determine that a sufficient length of saturated screen is present to enable the collection of a representative groundwater sample. If a sufficient length of saturated screen is not present in a monitoring well (after any redevelopment activities), the well will be abandoned and replaced, if necessary.

Monitoring wells that were evaluated on November 18 and 19, 2020 include:

- Aeration Basin Wells – AB-1 and AB-3
- Administration Building Wells – AD-1, AD-2, AD-3, AD-4, AD-5D, AD-6, AD-9D, AD-9DD
- North Landfarm Wells – LN-1, LN-2, LN-3, LN-4, LN-6
- Perimeter Wells – PER-2DD, PER-4, PER-8, PER-9D, PER-10
- Pipeline Wells – PL-4RR, PL-6RR, PL-8R
- Truck Loading Rack Wells – TL-1, TR-4R, TR-4D, TR-5D
- Fire Fighting Training Area – FA-7
- No. 1 Landfarm Wells – L1-1, L1-2, L1-3, L1-4

In addition to the evaluation of specified wells by a licensed well driller, the following

revisions and additions have been made to the well summary table for increased clarity:

- Construction details of all wells have been verified and revised (if necessary) to reflect measurements from Top of Casing (TOC) and not ground surface
- Revised column headings to clarify whether the total well depth was measured or obtained from the well record
- Column specifying the AOC the monitoring wells are primarily associated with for installation and investigation purposes
- Column specifying whether a soil boring log was available and included in the Well Manual

Should you have any questions or require additional clarification or information, please contact me at 732-739-6444 or via e-mail at ablake@earthsys.net. If you have any questions relating to the project and schedule moving forward, you can also contact Mr. John Schenkewitz of Hess Corporation at 609-406-3969.

Sincerely,

Amy Blake
Sr. Project Manager

c. Ms. Julia Galayada, NJDEP Case Manager (via email/Sharefile)
Mr. John Schenkewitz – Hess Corporation (via e-mail)
Mr. Rick Ofsanko – Earth Systems (via e-mail)
Mr. John Virgie – Earth Systems (via e-mail)

Appendix A

Inspection Summary Report for HESS PORT READING REFINERY - Activity Number SCI 170002

Nov 19, 2020 11:56

NOTE: The information contained in this report will be limited to the date each program began using the Department's integrated database, NJEMS. The programs began using the system for this information as follows: Air - 10/1998; Hazardous Waste - 1/2000; Water - 7/2000; TCPA - 12/2001; Land Use 12/2001; DPCC - 1/2002; Solid Waste - 1/2002; Right To Know - 3/2002 and Pesticides - 4/2002; Site Remediation - 3/2003 and Radiation (limited information) - 7/2006. For complete information prior to these dates, please submit an official OPRA request form to the Department. If printing this report, select landscape orientation.

Disclaimer: Only final inspection reports are listed in this report. Inspections for which a report has not been finalized by the Department will not appear in this report. Also, inspections which yield violations but where the inspected entity has not yet been notified of the violation are not listed in this report. For inspections indicating Out of Compliance, this means that violations were observed during the inspection, based on facts and information known to the Department at the time of the inspection. Errors or omissions in the factual basis for any violation may result in a future change in classification as a violation when such information becomes known.

Activity Number: SCI 170002 **Inspection Type:** (HW) Operation and Maintenance (O&M) Inspection **Program Interest ID:** NJD045445483

Inspection Start Date: 10/24/17 **End Date:** 10/26/17 **Lead Investigator:** Cosgrove, Sue

Program Interest Name: HESS PORT READING REFINERY

Address: 750 CLIFF RD Port Reading NJ 07064 **County:** Middlesex - Woodbridge Twp

Block(s) and Lot(s): Block 756.B Lot 2, Block 760.01 Lot 3, Block 760.02 Lot 1, Block 756 Lot 3, Block 756.B Lot 3, Block 756.02 Lot 1, Block 756.B Lot 7, Block 760 Lot 6, Block 760.02 Lot 2, Block 756.B Lot 4.A, Block 760.B Lot 2, Block 760 Lot 1.D, Block 760.A Lot

3, Block 760.B Lot 1, Block 756.01 Lot 2, Block 756.01 Lot 3, Block 756.B Lot 4.B, Block 1095.01 Lot 6, Block 760 Lot 1.B, Block 760.B Lot 3, Block blue Lot blue, Block 756.B Lot 1, Block 757 Lot 1. . . .

Comments:

O&M inspection included a field audit of the facility's groundwater sampling procedures on 10/24/17 and 10/26/17 to ensure the adequacy of the facility's groundwater monitoring system at the RCRA-regulated No. 1 Landfarm (No.1 LF). Facility provided the documentation during the audit and after the audit on 11/17/18 and 11/30/17, with some additional information on 5/2/18 upon request. Facility provided its Quality Assurance Project Plan (QAPP) (dated September 2017 and prepared by Earth Systems) for review, which is used as its sampling and analysis plan in conjunction with NJDEP's Field Sampling Procedures Manual (in place of the 8/23/91 Sampling & Analysis Plan (SAP) provided previously). Evaluation of the sampling procedures was based on the procedures specified in the RCRA Technical Enforcement Guidance Document (TEGD) for sampling and analysis. See checklist tab for inspection findings/comments and associated Word document for detailed site information.

The facility is the former Hess Port Reading Refinery (Hess) site that shut down and was purchased by Buckeye Port Reading Terminal LLC (Buckeye) in December 2013. Buckeye operates a bulk storage and distribution terminal for petroleum products at the site. Hess remains responsible for the cleanup of contamination at the site from its past operations and the closure/post-closure of three Solid Waste Management Units (SWMUs) previously operated at site, which includes the No. 1 LF as well as the North Landfarm (NLF) and South Landfarm (SLF). The landfarm closures and cleanup activities are being directed under a HSWA permit (Andy Park, USEPA Case Manager) and NJDEP-SRP oversight (Phil Cole, Case Manager, NJEMS PI #s 006148 & 653436).

A RCRA Land Unit Closure Inspection was also conducted of the landfarms at the time of this inspection (see BCI170001).

Below are the attachments to this report which can be found in Attachment List:

1. **Initial Interim NJPDES Permit No. 0028878 (effective 3/15/85)**
2. **NJPDES/RCRA-IWMF Operating Permit No. NJ0028878 (effective 5/1/88) ^**
3. **Minor Mod to RCRA-NJPDES/IWMF Operating Permit No. NJ0028878 (issued 3/21/90) ^**
4. **Major Mod to RCRA-NJPDES/IWMF Operating Permit No. NJ0028878 (issued 4/28/93)**
5. **QAPP dated September 2017 ***
6. **Second Quarter 2017 Progress Report dated 7/31/17 (excluding all Figures, Tables, Appendices except Figures 2, 4, 10 and Table 2) ***
7. **Fourth Quarter 2017 Progress Report dated 2/14/18**
8. **Facility Site Plan (see Figure 2 in Atts 6 * & 7)**
9. **GW Contour Map for No.1 LF (see Figure 10 in Att 6 * and Figure 8 in Att 7)**
10. **Low Flow Sampling Data Sheets for No. 1 LF wells ***
11. **Chain of Custody forms (see 2017 Oct Lab Reports below) ***
12. **2017 Oct Laboratory Report JC53803 (Wells L1-2, L1-3, L1-4)**
13. **2017 Oct Laboratory Report JC53909 (Well BG-3)**
14. **2017 Oct Laboratory Report JC54087 (Wells L1-1, BG-2)**
15. **2017 Updated Equipment SOPs**
16. **Horiba U52 Calibration Paperwork-Pine Environmental**
17. **Daily Calibration Sheets**
18. **2017 Inspection Activity Log No. 1 LF**

Key:
*** Also in RCRA File**
^ Only in RCRA File with previous O&M inspections

Subject Item: **HOAM** **0** **-** **Operation and Maintenance (O&M) Checklist**

Requirement Description	Compliance Status	Compliance Comments	Grace Days	Non Minor Reason	Requirement Source
		Hess Port Reading Refinery (Hess) shut down and site was sold to Buckeye Port Reading Terminal LLC (Buckeye) in December 2013. Buckeye operates a bulk storage and distribution terminal for petroleum products at the site. Hess dismantled and removed all refinery-related equipment/ components from the site. Hess agreed to retain responsibility for the cleanup of contamination at the site from its past operations (remedial action activities associated with Solid Waste Management Units (SWMUs), Areas of Concern (AOCs), Historic Spills (HSs) and Remediation Management Units (RMUs) identified			

*O & M CHECKLIST	Heading	at the site) and the closure/post-closure of three land treatment SWMUs it previously operated at the site, No. 1 Landfarm (No. 1 LF), North Landfarm (NLF), and South Landfarm (SLF). The landfarm closures and cleanup activities are being directed under a HSWA permit (Andy Park, USEPA Case Manager) and NJDEP Site Remediation Program (SRP) oversight (Phil Cole, Case Manager). This O&M audit covers only the No. 1 LF (as has been the case since the beginning) and is covered by a NJPDES/RCRA-Industrial Waste Management Facility (IWMF) Operating Permit (No. NJ0028878, effective 5/1/88, modified 3/21/90 & 4/26/93). There is a long, complex history of activity/ communication concerning these			Rules

		units and it is likely that the NLF and SLF have not been included in the O&M audits since permits were never issued for these units and they have remained in RCRA-Interim Status since receiving in 1980. The NLF operated from 1975 to 1985 and the SLF operated from 1975 to 1984. Additional information on these landfarms is provided in the Word doc associated with this O&M audit and they are also addressed in an NJDEP Land Unit Closure Inspection conducted at the same time as this O&M inspection (see BCI170001).			
*PART A: PRE-INSPECTION EVALUATION	Heading				Rules
*1 - FACILITY STATUS	Heading				Rules
Current RCRA-regulated land disposal units:.	Data Collection	See below			Rules
Unit Name.	Data Collection	No. 1 Landfarm (No. 1 LF)			Rules
# Wells.	Data Collection	6 wells (BG-2, BG-3, L1-1, L1-2, L1-3, L1-4)			Rules
LD Type.	Data Collection	Land Treatment Unit			Rules

Closure Status.	Data Collection	The No. 1 LF is not in operation and closure is pending. A Remedial Action Workplan (RAW) and Closure/Post-Closure Plan submitted to USEPA and NJDEP in September 2016 and are awaiting approval.			Rules
Indicate unit status and identify enforcement actions issued to facility:.	Data Collection	See below			Rules
Detection Monitoring.	Yes	According to facility's NJPDES/ RCRA-IWMF Operating Permit No. NJ0028878 (effective 5/1/88, modified 3/21/90 & 4/26/93), facility required to conduct a groundwater Detection Monitoring Program and facility representatives are not aware of that status changing.			Rules
Assessment Monitoring.	No				Rules
Corrective Action.	No				Rules
Compliance Monitoring.	No				Rules
3008(a) complaint/order.	No				Rules
3013 complaint/order.	No				Rules
3008(h)complaint/order.	No				Rules
7003 complaint/order.	No				Rules

Referral for litigation.	No				Rules
Indicate type and date of the most recent inspections conducted at facility:.	Data Collection	See below			Rules
Operation & Maintenance.	Data Collection	10/15/14			Rules
Comprehensive Monitoring Eval.	Data Collection	unknown			Rules
Compliance Eval. Inspection.	Data Collection	9/17/12			Rules
Other.	Data Collection	Land Unit Closure Inspection on 10/24/17 (conducted at same time as this O&M inspection; previous closure inspection done 10/15/14) RCRA generator inspections for Buckeye (NJR986639169) and Hess (NJD045445483) on 9/13/17			Rules
List deficiencies that were noted during last CME/O&M inspection of facility:.	Not Applicable	None			Rules
*2 - SAMPLING AND ANALYSIS PLAN:	Heading				Rules
When did current plan go into effect?.	Data Collection	Quality Assurance Project Plan (QAPP) prepared by Earth Systems and last updated September 2017 (used in conjunction with NJDEP's Field Sampling Procedures Manual and in place of the previously provided 8/23/91 Sampling & Analysis Plan)			Rules

Describe well sampling procedure. List provisions for measuring static water elevations prior to sampling; use of dedicated/non-dedicated sampling equipment; evacuation procedures; inventory of sampling devices; collection and containerization of samples; preservation methods; sample transferring procedures; chain-of-custody program; provisions for collecting field and trip blanks; operating, calibration, and maintenance procedures/schedule, etc.	Data Collection	Static water levels measured using required procedures and equipment; sampling equipment dedicated or deconed between wells; sample collection and containerization performed as per facility's QAPP, samples preserved as required; chain-of-custody documentation as required; and trip/ field blanks used as required.			Rules
*3 - WELL CONSTRUCTION PARAMETERS:	Heading				Rules
Well No.	Data Collection	Well #s identified below at each parameter.			Rules
U/D-Grad.	Data Collection	BG-2 - upgradient BG-3 - downgradient L1-1 - upgradient L1-2 - downgradient L1-3 - downgradient L1-4 - downgradient			Rules
Total Depth.	Data Collection	BG-2 - 9.20 ft BG-3 - 10.70 ft L1-1 - 13.50 ft L1-2 - 14.39 ft L1-3 - 11.00 ft L1-4 - 11.25 ft			Rules
Casing Material.	Data Collection	PVC			Rules
Casing Diameter.	Data Collection	4" diameter			Rules

Screen Depths.	Data Collection	BG-2 - 4.20 ft BG-3 - 5.00 ft L1-1 - 3.00 ft L1-2 - 7.00 ft L1-3 - 5.00 ft L1-4 - 4.00 ft			Rules
*PART B: FIELD AUDIT CHECKLIST	Heading				Rules
*I- REVIEW OF OPERATING RECORD OF FACILITY	Heading				Rules
*DOES OPERATING RECORD INCLUDE:	Heading				Rules
Annual reports of GW monitoring results?.	Yes	Submit semi-annual reports and quarterly progress reports.			Rules
Inventory of all sampling devices and purging equipment?.	Yes	Some supplied through rental company (Pine Environmental Services Inc)			Rules
Operating, calibration and maintenance procedures?.	Yes	SOPs maintained as per NJDEP Lab Certification Program for use and management of testing equipment (last updated June 2017).			Rules
Operating, calibration and maintenance procedures?.	Yes				Rules
Criteria used to replace/repair sampling equipment or wells?.	Yes	Routine monitoring well inspections conducted.			Rules
Schedule for performing O&M activities?.	Yes				Rules
Records for GW monitoring providing a) date, time of sampling; b) individuals who performed sampling; c) date(s) analyses were performed; d) analytical techniques or methods used; e) results of analysis?.	Yes				Rules

Determination of GW flow rate and direction(s) in uppermost aquifer on annual basis?.	Yes	GW flow is determined on a monthly basis using a portion of the wells at the site and annually at all wells, including those at the No. 1 LF.			Rules
Is a copy of the Sampling and Analysis Plan on-site?.	Yes				Rules
Have there been changes to components of the GW monitoring system (new wells, abandoned wells, repairs, replacement of parts)?.	No	Two wells that were formerly stick-up wells, BG-2 and L1-1, were modified to flush-mount wells to accommodate some roadway changes at the terminal.			Rules
Are there other activities on site that may affect well system?.	No				Rules
Is there a program established to periodically re-survey well head elevations?.	Yes	Last resurveyed in 2014 and done periodically.			Rules
*II- VISUAL INSPECTION OF EACH WELL FOR EVIDENCE OF DAMAGE	Data Collection				Rules
*EXAMINE WELLS TO DETERMINE FOLLOWING:	Heading				Rules
Are wells clearly marked and identified?.	Yes	Identifying markings at Well L1-4 were peeling and markings at other wells were fading (but visible). Sampling contractor to re-label wells as necessary.			Rules
Is there evidence of casing degradation (collision damage, excessive corrosion, cracking, subsidence, frost heaving)?.	No				Rules
Is there evidence of apron degradation (missing, cracking, subsidence, frost heaving, etc)?.	No				Rules

Signs of problems with cap (missing, excessive corrosion, cracking)?.	No				Rules
Did location of wells correspond to facility schematic?.	Yes				Rules
Signs of problems with locks (missing, excessive corrosion)? .	No				Rules
Does the well have a surveyed casing elevation mark?.	Yes				Rules
Is there standing or ponded water between inner and outer casings?.	No	None noted			Rules
Are boreholes vertically true?.	Yes	Well casings appeared visually to be generally vertical.			Rules
Other:.	Not Applicable				Rules
*III- OBSERVED FIELD SAMPLING PROCEDURES	Data Collection				Rules

*1 - PARTICIPANTS:	Heading	NJDEP: Susan Cosgrove, Environmental Specialist 3, 609-439-9757 HESS: John Schenkewitz, Manager - Remediation, 609-406-3969, C 732-614-0726 Al Roscioli, Rubicon (Hess Contractor) (10/26/17 only) SAMPLING CONTRACTOR - EARTH SYSTEMS INC: Amy Blake, Sr. Project Mgr, 732-739-6444, ext 2305 (10/24/17 only) John Virgie, LSRP, 732-739-6444, ext 2304 (10/24/17 only) Rick Ofsanko, Principal, 561-588-3985 (email only) Ryan Carr, Sampler Mike Piegaro, Sampler			Rules
NAME.	Data Collection	See Above			Rules
TITLE.	Data Collection	See above			Rules
AFFILIATION.	Data Collection	See above			Rules
TEL. NO.	Data Collection	See above			Rules
Name/address of environmental firm doing sampling: .	Data Collection	Earth Systems, Inc 1625 Highway 71 Belmar, NJ 07719 732-739-6444			Rules

*2 - WEATHER CONDITIONS:	Heading	10/24/17: Overcast with some drizzle very short time in am & short period of rain in pm, ~70 degrees F, windy 10/26/17: Sunny, 55-60 degrees F, windy			Rules
*3 - FIELD EQUIPMENT	Heading				Rules
*3A. STATIC WATER LEVEL	Heading				Rules
Water level indicator.	Yes				Rules
Steel tape.	Yes				Rules
Scale (ft):.	Data Collection	0.01			Rules
Electronic Interface Probe (DNAPL, LNAPL).	Yes				Rules
Other:.	Yes				Rules
Manufacturer: .	Data Collection	Solinst Interface Meter			Rules
Model No.	Data Collection	Model 122			Rules
Notes:.	Heading				Rules
*3B. EVACUATION	Heading	Purging of monitoring wells conducted via low-flow purging and sampling methodology using a water quality meter with flow cell and sensors to monitor for the stabilization of indicator parameters prior to collection of samples. Purge rates are monitored and adjusted to stabilize drawdown.			Rules

Bailer.	No				Rules
Pump.	Yes				Rules
Other:.	Yes	Water quality meter with flow cell			Rules
Pump type (submersible, bladder, gas displacement, etc.):.	Data Collection	Submersible			Rules
Manufacturer:.	Data Collection	Pump: Proactive Water Quality Meter: Horiba			Rules
Model No.:.	Data Collection	Pump: Monsoon Pro Water Quality Meter: U-52			Rules
Pump flow rate (g.p.m.):.	Data Collection	Between 100 & 400 ml/min			Rules
How was flow rate determined?.	Data Collection	Measured into graduated cylinder and timed.			Rules
Power source (gas, electric/compressor, battery):.	Data Collection	Battery			Rules
Hose construction (PVC, Tygon, polyethylene, etc):.	Data Collection	Teflon-lined tubing			Rules
Dedicated?.	No	Water quality meter and pump cleaned between wells using Alconox and deionized water rinse. Hose thrown away.			Rules
Describe handling/disposal of purged water:.	Data Collection	Purged water drummed and shipped off site for disposal as nonhazardous waste			Rules

*3C. SAMPLE COLLECTION	Heading	Groundwater samples collected via low-flow sampling methodology using a water quality meter with flow cell and sensors to monitor for the stabilization of indicator parameters prior to collection of samples.			Rules
Bailer.	No				Rules
Pump.	Yes	Submersible (same as used for evacuation)			Rules
Other.	Yes	Water quality meter with flow cell (same as used for evacuation)			Rules
Bailer construction (Teflon, PVC, etc.):.	Not Applicable				Rules
Bailer size:.	Not Applicable				Rules
Dedicated?.	Not Applicable				Rules
Does bailer have check valves/bottom emptying devices (Y/N)?.	Not Applicable				Rules
What type of lines were used with bailers:.	Not Applicable				Rules
Stainless steel Teflon-coated cord Cotton rope PVC cord Nylon cord Other:.	Not Applicable				Rules
*3D. AIR MONITORING	Heading				Rules
HNU.	No				Rules
OVA.	No				Rules
Other.	Yes	PID used			Rules
Manufacturer:.	Data Collection	RAE Systems			Rules
Model No.	Data Collection	MiniRAE 2000			Rules
Notes:.	Heading				Rules

*3E. ANALYTICAL INSTRUMENTATION USED IN FIELD	Data Collection	The water quality meter with flow cell (Horiba Model No. U-52) allows for continuous measurements of indicator parameters. The unit was calibrated by Pine Environmental (equipment owner) for all parameters on 10/23/17 and done by sampling crew prior to sampling each day for pH, conductivity, turbidity and DO.			Rules
pH Meter.	Yes				Rules
MANUFACTURER/MODEL NO.	Data Collection	See "Analytical Instrumentation" heading above.			Rules
CALIBRATION DATE.	Data Collection	See "Analytical Instrumentation" heading above.			Rules
Thermometer.	Yes				Rules
MANUFACTURER/MODEL NO.	Data Collection	See "Analytical Instrumentation" heading above.			Rules
CALIBRATION DATE.	Data Collection	See "Analytical Instrumentation" heading above.			Rules
Specific Conductance.	Yes				Rules
MANUFACTURER/MODEL NO.	Data Collection	See "Analytical Instrumentation" heading above.			Rules
CALIBRATION DATE.	Data Collection	See "Analytical Instrumentation" heading above.			Rules

Other:.	Yes	Dissolved oxygen, redox potential, turbidity			Rules
MANUFACTURER/MODEL NO.	Data Collection	See "Analytical Instrumentation" heading above.			Rules
CALIBRATION DATE.	Data Collection	See "Analytical Instrumentation" heading above.			Rules
Notes:.	Heading				Rules
*4 - SAMPLING EVALUATION	Heading				Rules
*4A - SAFETY CONSIDERATIONS	Heading				Rules
Were adequate safety gear and precautions used by the sampling crew? .	Yes				Rules
Did the sampling team take atmospheric readings in the wellhead before sampling?.	Yes				Rules
Did the sampling team take any periodic surveys of the atmosphere?.	No	Deemed unnecessary based on historical knowledge/data at the site.			Rules
*4B - ESTABLISHING CLEAN ZONE AND DECONTAMINATION	Heading				Rules
Did sampling team provide a decon zone designating a clean and contaminated area? .	Yes	Deemed unnecessary as wells not heavily contaminated thus no contaminated area.			Rules
Was plastic sheeting used to cover the ground?.	Yes				Rules
Prior to use, are all bailers, sampling bottles, etc. kept clean, i.e. not placed in direct contact with ground?.	Yes				Rules

Did crew thoroughly clean sampling devices between samples?.	Yes	Water quality meter and pump cleaned using Alconox and deionized water rinse between samples, but new tubing used at each well.			Rules
*4C - WELL-PURGING PROCEDURES	Heading				Rules
Did sampling crew measure static water levels and well depths before purging?.	Yes	Static water levels measured every 5 mins during monitoring of indicator parameters. Well depths measured after sampling so as not to disturb bottom of well before sampling, though well depths of all monitoring wells at the site measured yearly.			Rules
Is the well head elevation reference point clearly marked?.	Yes				Rules
Did sampling crew record depth to +/- 0.01 ft?.	Yes				Rules
Did sampling crew take air sample in well head for organic vapors before evacuation?.	Yes				Rules
Did sampling crew lower interface probe to detect immiscible layers? Were immiscible samples collected?.	Yes	No immiscible layers			Rules
Did crew evacuate low yielding wells to dryness before sampling?.	Not Applicable				Rules

Did crew evacuate high yielding wells for three casing volumes?.	Not Applicable	Low flow purging and sampling conducted at wells (continuous indicator parameter monitoring indicates when water in well is representative of in-situ groundwater quality).Low flow purging and sampling conducted at wells (continuous indicator parameter monitoring indicates when water in well is representative of in-situ groundwater quality).			Rules
Was gasoline transported in same vehicle as sample bottles, field and trip blanks, etc?.	No				Rules
Was gasoline pump/generator/compressor set down-wind of sampling well site?.	Yes				Rules
Were dedicated hoses used for pumping each well?.	Yes				Rules
Describe decontamination method used to clean pump between wells:.	Data Collection	Water quality meter and pump cleaned between wells using Alconox/water mixture and deionized water rinse.			Rules
*4D - SAMPLE COLLECTION AND ANALYSIS	Heading				Rules

Did the sampling crew sample background wells before sampling downgradient wells?.	Not Applicable	Deemed unnecessary by the facility based on past sampling data since the wells are not heavily contaminated.			Rules
What order were samples collected, e.g., volatiles, semi-volatiles, Total Dissolved Solids, etc? .	Data Collection	Volatiles, semi-volatiles, total metals, general chemistry compounds			Rules
What parameters were determined in the field?.	Data Collection				Rules
Temperatures.	Yes				Rules
pH.	Yes				Rules
Specific conductivity.	Yes				Rules
Redox potential.	Yes				Rules
Chlorine.	No				Rules
Dissolved oxygen.	Yes				Rules
Turbidity.	Yes				Rules
Other.	No				Rules
Did the sampling crew measure static water level immediately before sampling (low-yielding well) to determine if well had sufficiently recovered?.	Yes				Rules
If crew used bailers, did they transfer bailer contents directly to sample container?.	Not Applicable				Rules
If crew used bailers, was the bailer lowered gently into the water column to minimize possible volatilization of organics?.	Not Applicable				Rules
Did sampling crew use fluorocarbon resin or polyethylene containers with polypropylene caps for samples requiring metals analysis?.	Yes				Rules

Did sampling crew use glass bottles with fluorocarbon resin-lined caps for samples requiring metals?.	Yes	CORRECTION TO REQUIREMENT WORDING: Should say "organics analyses", not "metals" as written (EPA's RCRA Ground-Water Monitoring TEGD dated September 1986, p. 109, states "...glass bottles with fluorocarbon resin-lined caps should be used for samples requiring organics analyses.")			Rules
If samples are for inorganic analysis, does the cleaning procedure include the following sequential steps?:.	Not Applicable	Bottles are new			Rules
Dilute acid rinse (HNO3 or HCl)?.	Not Applicable				Rules
Distilled/deionized water rinse?.	Not Applicable				Rules
If samples are collected for organic analyses, did cleaning procedures include:.	Not Applicable				Rules
Non-phosphate detergent wash?.	Not Applicable				Rules
Tap water rinse?.	Not Applicable				Rules
Distilled/deionized water rinse?.	Not Applicable				Rules
Acetone rinse?.	Not Applicable				Rules
Pesticide-grade hexane rinse?.	Not Applicable				Rules
If dedicated sampling equipment is not used, is equipment disassembled and thoroughly cleaned prior to sampling.	Yes	Water quality meter and pump cleaned between wells using Alconox/water mixture and deionized water rinse.			Rules

Were disposable gloves changed prior to next sampling?.	Yes				Rules
*4E - FIELD QA/QC	Heading				Rules
Were the following performed at least once during each day of sampling?.	Yes				Rules
1. Field Blanks?.	Yes				Rules
2. Trip Blanks.	Yes				Rules
After each sampling, are all samples labeled?.	Yes				Rules
Information given on labels:.	Data Collection	Sample ID#, date/ time of sample, client/project name, preservative used, person collecting sample.			Rules
Give specifications of containers used:.	Data Collection	A total of 10 bottles supplied by the lab were used for sample collection at each well. Volatiles - 3 x 40ml glass vials Semi-Volatiles - 2 x 1L amber glass Total Metals - 500ml plastic Mercury - 250ml plastic Ammonia - 60ml glass Cyanide - 60ml glass Phenols - 500ml glass			Rules
Were samples preserved?.	Yes				Rules
Describe preservatives used (e.g. HCl drops):.	Data Collection	Volatiles - HCl Total Metals - HNO3 Mercury - HNO3 Ammonia - H2SO4 Cyanide - NaOH/ascorbic acid Phenols - H2SO4			Rules

Was pH of preserved samples verified in the field using pH paper?.	Not Applicable	Water quality meter monitors for pH as indicator parameter every 5 minutes during well stabilization and pH is also verified by laboratory.			Rules
Were samples immediately placed in an ice cooler (temp. 4oC)?.	Yes				Rules
Was a field log book/field data sheets used to record information about each sample collection? .	Yes				Rules
Were Chain of Custody forms used?.	Yes				Rules
Was each Chain of Custody form filled out completely after each sampling? .	Yes				Rules
If not, when were they filled out? .	Not Applicable				Rules
List the information requested on the facility's chain-of-custody form: .	Data Collection	Facility/client names/addresses, Project info #, sample/well ID#, date, time, sampler's names/ initials, sample type, number of preserved bottles, analysis requested			Rules
Name, address and certification number of analytical Laboratory used:.	Data Collection	SGS Accutest Laboratories Inc 2235 Rt 130 Dayton, NJ 08810 Lab certification #: 12129			Rules
Identify deficiencies in the way owner/operator's sampling crew departed from written Sampling and Analysis Plan:.	Not Applicable	None noted			Rules
INDICATE WHAT PARAMETERS WERE SAMPLED FOR.	Data Collection				Rules

WELL/SAMPLE NO.	Data Collection	All 6 wells (BG-2, BG-3, L1-1, L1-2, L1-3, L1-4) sampled for the parameters indicated below.			Rules
VOLATILE ORGANICS.	Yes				Rules
SEMI-ORGANIC VOLATILES.	Yes				Rules
PESTICIDES/HERBICIDES.	No				Rules
PCBs.	No				Rules
TOTAL METALS.	Yes				Rules
DISSOLVED METALS.	Yes				Rules
INDICATORS.	Yes				Rules
RADIOLOGICAL.	No				Rules
OTHER:.	Data Collection	Ammonia, Cyanide, Phenols			Rules
SAMPLING EVALUATION SHEET (repeat for each well).	Data Collection				Rules
Well No.	Data Collection	Well #s identified below for each item.			Rules
Depth of well (ft).	Data Collection	BG-2 - 9.20 ft BG-3 - 10.70 ft L1-1 - 13.50 ft L1-2 - 14.39 ft L1-3 - 11.00 ft L1-4 - 11.25 ft			Rules
Length of Column (ft).	Data Collection	BG-2 - 5.81 ft BG-3 - 5.30 ft L1-1 - 6.59 ft L1-2 - 7.83 ft L1-3 - 4.21 ft L1-4 - 2.70 ft Calculated length of column = total well depth minus depth to water			Rules
Well diameter (in).	Data Collection	All wells 4" diameter.			Rules

Calculated well volume.	Data Collection	BG-2 - 3.79 gals BG-3 - 3.46 ft L1-1 - 4.30 gals L1-2 - 5.11 gals L1-3 - 2.75 gals L1-4 - 1.76 gals Calculated based on the well casing volume of 0.653 gals per foot of depth in a 4'' diameter well.			Rules
Purging device.	Data Collection	All wells purged using low flow with submersible pump.			Rules
pH.	Data Collection	BG-2 - 5.85 BG-3 - 6.53 L1-1 - 4.72 L1-2 - 6.77 L1-3 - 7.08 L1-4 - 7.08			Rules
Temp.	Data Collection	BG-2 - 22.49 BG-3 - 17.60 L1-1 - 22.57 L1-2 - 20.33 L1-3 - 19.27 L1-4 - 21.75 All measurements in degrees Celcius			Rules
Conductance.	Data Collection	BG-2 - 0.440 BG-3 - 0.344 L1-1 - 0.354 L1-2 - 1.02 L1-3 - 0.996 L1-4 - 0.422 All measurements in micro-siemens per centimeter (µs/cm)			Rules
Odor/Appearance.	Data Collection	All wells were clear			Rules

Sample time.	Data Collection	BG-2 - 1430 hrs on 10/26/17 BG-3 - 1000 hrs on 10/25/17 L1-1 - 1005 hrs on 10/26/17 L1-2 - 1030 hrs on 10/24/17 L1-3 - 1350 hrs on 10/24/17 L1-4 - 1240 hrs on 10/24/17			Rules

Appendix B

Appendix B – Specific Well Comments & Responses

AERATION BASINS:

AB-2: Resolve decommissioning documentation with the Bureau of Water Supply and Well Permitting.

- **The NJDEP Bureau of Water Allocation and Well Permitting (BWAWP) was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

AB-2R: Correct WCST to the following: Casing length 2', Depth of Well TOC 22'.

- **The total depth (TD) of well AB-2R has been revised to include the well stick-up height (22 feet (ft) from Top of Casing (TOC)). However, the total casing length is 3 ft (1.89 ft stick up and then 1 ft below grade before the well screen starts).**

AB-4D: Confirm gauged TD TOC. Ensure low flow pump placement is targets center of 5' well screen.

- **Based on the November 2020 well gauging data, the TD of well AB-4D is 33 ft from TOC, which matches the well record. During groundwater sampling, pump placement will be targeted at 30.5 ft below TOC (the center of the 5 ft well screen).**

AB-5: Correct WCST to the following: Screen interval 2-10' BGS; 5-13' TOC

- **The WCST has been revised to reflect measurements from TOC and not ground surface.**

AB-6: Missing geologist boring log. Installed December 2017.

- **The geologist boring log has been included in the well manual.**

- Clarify if this well is located at the abandoned AB-2/AB-2R location or a different location.
  - **Monitoring well AB-6 is a replacement well for wells AB-2 and AB-2R. The well was damaged due to the high traffic location of the well. Therefore, the well was moved downgradient when it was replaced for the 3rd time. The well name was changed since the location was not the same as the former AB-2/AB-2R monitoring well.**

ADMINISTRATION BUILDING:

AD-1: Boring was deeper (18' bgs) than completed well (16' bgs). Well construction record and Well Construction Summary Table used the total boring depth as the depth of the well.

- Correct WCST to the following: screen interval 3-16' BGS; 3-16' TOC; depth of well 16' BGS.
  - **See response below**

- Gauged depth TOC 2019 was 10.85' so loss of screen interval. Investigate for damage, blockage, silting, and repair.

- **On November 18 and19, 2020, Earth Systems redeveloped well AD-1. After further investigation into the well record and geological log, it was determined that the well bottom is closer to 13 ft and not 16 ft. The TD from TOC gauged on November 19, 2020 was measured at 13 ft. The well is currently being evaluated to determine if actual well construction is sufficient for groundwater sampling purposes or if the well needs to be replaced.**

AD-3: well record identifies screen interval 1-11' BGS, casing +2' AGS, 3-13' TOC. Surveyed casing AGS is +2.85' (close to 3') and 2019 gauged TD TOC was 13.75' TOC (close to 14'). This indicates casing may have been +3' AGS which would make the screen interval 4-14' TOC as identified in WCST.

- Confirm gauged TD TOC.
  - **Monitoring well AD-3 was redeveloped in November. Following redevelopment, the gauged TD from TOC was measured at 14.01 ft.**

- Correct WCST to the following: casing length 4', depth of well BGS 11', depth of well TOC 14'
  - **The WCST has been revised to reflect measurements from TOC and not ground surface.**

AD-3D: Summary table information is consistent with the geologist well diagram and field measurements. 2019 TD gauged 29' TOC. Well survey casing 2.72' AGS (about 3').

- Geologist log/well diagram is not the same as the well construction record.
  - **The WCST reflects the information obtained from the well record, which is consistent with gauged TD measurement collected on November 5, 2020 (see below).**

- Confirm gauged TD TOC.
  - **The gauged TD from TOC was measured at 29 ft on November 5, 2020**.

AD-5D: Geologist boring log missing. Well installed November 2011.

- 2019 gauging (28.7' TOC) indicates some loss of screen interval. Confirm gauged TD TOC and evaluate for redevelopment of 5' screen interval.
  - **The geologist boring log has been added to the well manual. Monitoring well AD-5D was redeveloped in November. Following redevelopment, TD from TOC was measured at 29.9 ft, which indicates that there has been no loss of screen interval (screen interval of 25-30 ft).**

AD-7: Try to locate the well and resolve decommissioning documentation with Bureau of Water Supply and Well Permitting

- **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

AD-9D: Confirm gauged TD TOC and evaluate for redevelopment of 5' screen interval.

- **In November, Earth Systems redeveloped well AD-9D. Following redevelopment, the**

gauged TD from TOC was measured at 27.8 ft (screen interval of 23-28 ft).

AD-9DD: Geologist boring log missing. Well installed December 2017.

- 2019 gauged TD was 55.3' TOC (loss of entire screen interval) or well construction record not accurate.
  - Confirm gauged TD TOC and evaluate well construction/repair/replacement.
  - **The geologist boring log has been added to the well manual. In November, Earth Systems redeveloped well AD-9DD. Following redevelopment, the gauged TD from TOC was measured at 60.2 ft, which indicates no loss of screen interval (screen interval of 55-60ft).**

AD-10: Geologist boring log missing. Well installed December 2017.

- **The geologist boring log has been included in the well manual.**

AD-10DD: Geologist boring log missing. Well installed December 2017.

- **The geologist boring log has been included in the well manual.**

- Confirm gauged TD TOC.
  - **Well AD-10DD was gauged on November 5, 2020 and the TD from TOC was measured at 64.15 ft.**

- Ensure low flow pump placement is targeted to center of 5' well screen.
  - **The screen interval from TOC is 59 to 64 ft. During groundwater sampling, pump placement will be targeted at 61.5 ft below TOC (the center of the 5 ft well screen).**

FIRE TRAINING AREA WELLS:

FA-1 through FA-7:

- Geologist boring logs/observations missing. The wells were installed January 2020.
  - **The geologist boring logs have been included in the well manual.**

- Request field gauged TD from TOC.
  - **A column has been added to the WCST that includes the gauged well measurements recorded on November 5, 2020.**

No. 1 LANDFARM WELLS:

BG-1: Deep well No. 1 Landfarm. Form A provided measurements based on TOC. Since 1.26' casing AGS, and screen 25.29-45.29 TOC, the screen was likely about 24-44' BGS.

- **Well construction details cannot be verified since the monitoring well was abandoned in 1991. The WCST will be revised to reflect the information stated above.**

BG-2: The WCST identifies the well record information based on 4.2' casing and 5' of screen, and TD 9.2'. This is an older permit – it is not clear if "total depth" reference point is BGS or TOC. Based on other wells installed in this timeframe, the well records appear to reflect well construction BGS. The prior WCST identified undated gauged TD 9' TOC.

This well had a casing stickup (1.77' AGS) based on the 2014 well survey (TOC 9.02' msl and ground surface 7.25' msl). The 2017 well survey TOC 6.96' msl and ground surface 7.16' msl shows conversion to a flush mount well. The total casing length reduction was just over 2' (2.06').

- Due to the casing length reduction (1.77' AGS and about 0.25' BGS), the WCST information needs to be updated to reflect the BGS casing reduction of 0.25'. This would change the screen interval to 4-9' BGS and TOC as flush mount well, casing length 4', depth of well 9' BGS and 9' TOC. The prior gauged TD 9' TOC is consistent with this.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm current gauged TD TOC.
  - **The TD from TOC was measured at 8.95 ft on November 5, 2020.**

- DTW range in prior well construction summary table 2-3' TOC. This indicates a water level within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

BG-3: Summary table information is consistent with the well record. In this case (which is rare) casing length clearly includes 2' AGS and 5' BGS, and well screen 5-10' BGS, 7-12' TOC. Undated gauged well TD 9.9' TOC.

- Confirm TD TOC of well. Minimal open screen interval appears to be available (7-9.9' TOC).
  - **The TD from TOC was measured at 11.25 ft on November 5, 2020.**

- DTW range in prior well construction summary table 3-4' TOC. This indicates the water level is within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

L1-1: The WCST identifies the well record information based on 5' casing, and 10' of screen, and TD of 15'. This is an older permit – it is not clear if "total depth" reference point is BGS or TOC. Based on other wells installed in this timeframe, the well records appear to reflect well construction BGS. The prior WCST identified undated gauged TD 13.5' TOC.

The well had a casing stickup (0.65' AGS) based on the 2014 well survey (TOC 11.29, ground surface 10.64' msl). The 2017 well survey (TOC 9.91' msl and ground surface 10.14' msl) shows conversion to a flush mount well. The total casing length reduction was 1.38'.

- Due to the casing length reduction (0.65' AGS and 0.73' BGS), the WCST information needs to be updated to reflect a BGS casing reduction of 0.75'. This would change the screen interval to 4.25-14.25 BGS and TOC as flush mount well, casing length 4.25', well depth BGS 14.25' and TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Correct permit number is 2600008068.
  - **The WCST has been updated to reflect the correct permit number.**

- Confirm current well gauged TD TOC.
  - **The TD from TOC was measured at 13.45 ft on November 5, 2020. The well was then redeveloped and re-gauged on November 19, 2020 with a TD of 14.2 ft.**

- DTW range in prior WCST 3-4' TOC. This indicates a water level within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

L1-2: The well record identifies 4' casing, 10' screen and TD 14'. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. The undated gauged depth TOC in prior WCST was 14.3' TOC, and 2014 survey casing AGS 1.42' (about 1.5').

- The well construction summary table uses the information on the well record as BGS and adds 1.5 casing AGS to the well record information: screen 4-14' bgs and 5.5-15.5' TOC. This appears to be accurate based on other wells installed in 1985.
  - Based on the above, the WCST should be corrected for: casing length should be 5.5', and well depth TOC should be 15.5' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged TD TOC.
  - **The TD from TOC was measured at 14.37 ft on November 5, 2020. The well was then redeveloped and re-gauged on November 19, 2020 with a TD of 14.75 ft.**

- DTW range in prior WCST 5-6' TOC. This indicates a water level may be within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

L1-3: Well record identifies 5' screen, 9.4' TD, and casing length is not clear (also says 9.4'). This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC, plus, for this permit, the same information was provided in two places. 2014 well survey casing about 1' AGS, and undated gauged TD TOC 9.41' TOC in prior WCST. Well installations of this period typically reflected well construction BGS. Conservatively evaluate well construction with 1' casing AGS added to well construction BGS.

- Correct WCST to include casing 1' AGS with well TD and screen length information as follows: screen 4.4-9.4' BGS, 5.4-10.4' TOC, casing length is 5.4', depth well BGS 9.4' BGS and depth well TOC 10.4' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged well TD TOC.

- **The TD from TOC was measured at 10.2 ft on November 19, 2020. The well was then redeveloped and re-gauged on November 19, 2020 with a TD of 11.2 ft.**

- DTW range in prior WCST 4-5' TOC. This indicates a water level within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

L1-4: Well record identifies 4' casing, 5' screen, 9' TD. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. Well records of the time period appear to reflect well construction BGS. 2014 well survey casing 1.78' (about 2') added to the 9' TD in well record would be consistent with undated gauged TD TOC 10.89' TOC in prior WCST. Screen interval appears to be 4-9' BGS, 6-11' TOC as shown on the WCST.

- Correct WCST to the following: casing length to 6' and well depth TOC to 11' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged well TD TOC.
  - **The TD from TOC was measured at 11.3 ft on November 5, 2020.**

- DTW range in prior WCST 7-8' TOC. This indicates a water level is within the screen interval of the well.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

L1-6: Well record identifies 6' casing, 10' screen, and 14' TD which appears to be well construction BGS. This well location is near L1-2.

- WCST should reflect casing stickup of 2', not flush mount. Screen 4-14' BGS, 6-16' TOC, and 6' casing length.
  - **The WCST has been updated to reflect the well construction information summarized above.**

- Should try to locate to assess/abandon. Resolve well decommissioning with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

<u>MODIFIED WELLS/ RESURVEYED WELLS:</u>
Note: please clarify is the wells are modified, resurveyed, or both.

- **SP-1:** was casing cut 0.31' or is this a 2014 (9.26' TOC/9.47' GS) and 2017 (8.95' TOC/9.17' GS) resurvey difference?

- **The monitoring well was modified to be a flush mount and resurveyed. See monitoring well information below.**

- **SP-2:** was casing cut 0.59', or is this a 2014 (10.77' TOC/10.88' GS) and 2017 (10.18' TOC/10.36' GS) resurvey difference?
  - **The monitoring well was modified to be a flush mount and resurveyed. See monitoring well information below.**

SP-1 (well records in Volume 2): Well record identifies screen 5-15' BGS, 7-17' TOC, casing 2' AGS, casing length 7'.
2014 well survey did not reflect original well record casing AGS. 2019 gauged TD 11.7' TOC.

- At a minimum, correct WCST to reflect no casing AGS: screen interval 5-15' BGS and 5-15' TOC (not 7-17' TOC), casing length 5' (not 7'), depth of well TOC 15'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged well TD TOC. 2019 gauged TD of 11.7' TOC shows well screen loss, or more than 2' of casing was cut from well.
  - **The TD from TOC was measured at 12.71 ft on November 5, 2020, which indicates minimal loss of screen interval (screen interval of 3-13 ft from TOC).**

- No geologist log provided. Well installed July 1991.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

- DTW range in prior well construction summary table 4-5' TOC. This indicates a water level is within the well casing or very close to top of screen. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

SP-2 (well records in Volume 2): Well record identifies screen 5-15' BGS; 7-17' TOC, casing 2' AGS, casing length 7'. 2014 well survey does not reflect original well record casing AGS. 2019 gauged TD 13.1' TOC.

- At a minimum, correct WCST to reflect no casing AGS: screen interval 5-15' BGS and 5- 15' TOC (not 7-17' TOC), casing length 5' (not 7'), depth of well TOC 15'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged well TD TOC. 2019 gauged TD of 13.1' TOC shows well screen loss, or more than 2' of casing was cut from well.
  - **The TD from TOC was measured at 13 ft on November 5, 2020, which indicates no screen interval loss (screen interval of 3-13 ft from TOC).**

- No geologist log provided. Well installed July 1991.
  - **The geologist boring log could not be located. Historic reports will continue to be**

reviewed to attempt to locate the log.

- DTW range in prior well construction summary table 3-4' TOC. This indicates a water level is within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

SP-3 (well records in Volume 2): Well record identifies screen 5-15' BGS; 7-17' TOC, casing 2' AGS, casing length 7'. 2014 well survey does not reflect original well record casing AGS. 2019 gauged TD 14.89' TOC.

- At a minimum, correct WCST to reflect no casing AGS: screen interval 5-15' BGS, 5-15' TOC (not 7-17' TOC), casing length 5' (not 7'), depth of well TOC 15' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC. The correct well information is as follows – TD from TOC is 13 ft and screen interval of 3-13 ft.**

- Confirm gauged TD TOC. 2019 gauged TD identifies 14.89' TOC so minimal screen loss.
  - **The TD from TOC was measured at 13 ft on November 5, 2020 (screen interval of 3 to 13 ft from TOC).**

- No geologist log provided. Well installed July 1991.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

- DTW range in prior well construction summary table 3-4' TOC. This indicates a water level is within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

Other No. 1 Landfarm Wells located in well data base (attached):

3 wells: 26-6577, 26-6578, 26-6579 (May 1984) (OW-wells)
5 wells: 26-7317 to 26-7321 (December 1984) (W-wells)

- Locate and resolve loss/abandonment documentation with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

- The December 1984 wells may have been locations within the No. 1 Landfarm. Evaluate well locations with No. 1 landfarm closure plan figures.
  - **Historic reports will be evaluated to determine the former locations of these monitoring wells.**

NORTH LANDFARM WELLS:

NOTE: 4 monitor wells (26-7560 to 26-7563) were installed in the North Landfarm area in 1985. Two wells were abandoned/not used (MW-1 and MW-4 locations based on RCRA permitting figure).

Which permits went with which location has been the puzzle - Based on boring TD on the well log, casing AGS from 2014 well survey, and 2019 gauged TD TOC, BGWPA concurs that LN-2 appears to match MW-3 information (25-7562) and LN-3 appears to match MW-4 information (25-7563). This indicates that well location figures renamed well locations. MW-4 location on RCRA figures was likely the MW-1 permit (25-7560), and MW-1 location on RCRA figures was likely the MW-2 permit (25-7561). Additional wells were installed after these 4 wells (LN-1, LN-4, and LN-5 to LN-7).

"MW-1 (1985)" (26-7560): This well was Installed at the North Landfarm. This well appears to have been located at the MW-4 well location on RCRA North Landfarm figures.
"MW-2 (1985)" (26-7561): This well was Installed at the North Landfarm. This well appear to have been the MW-1 location on RCRA figures. The abandonment record linked to 25-7560 should be for this well (25-7561) based on the abandonment record depth information.

LN-1: Incomplete documentation on well record. 10' screen recorded with no information on casing length or well total depth. 2014 well survey casing 1.86' AGS (about 2') and 2019 gauged TD TOC 17.35' TOC.

- Based on TD of boring (16' bgs), screen length (10'), and casing AGS (2'), concur with describing well screen as 6-16' BGS and 8-18' TOC.
- The depth to water range provided in the prior well construction summary table (4-5' TOC) indicates a water level within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

- Correct WCST: casing length 8', and depth of well TOC 18' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

LN-2 ("MW-3 (1985)" permit): Installed 1985 as part of original North Landfarm permitting as MW-3 and renamed LN-2. Well record identifies 6' screen, 7' casing, 13' TD. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. Based on 2019 gauged TD TOC (13.7' TOC) and casing AGS (0.77' – round to 0.75'), BGWPA concurs that LN-2 appears to match "MW-3" information.

- LN-2, LN-3, LS-2, LS-3 and LS-4 were all installed at the same time. LS-2, LS-3 and LS-4 well construction, casing AGS, and gauged TD indicate the well record did not reflect casing interval AGS. Therefore, LN-2 casing AGS (0.77' – round to 0.75') should be added to the well record casing length and total depth TOC measurements.

- Correct WCST: screen 7.75-13.75' TOC, casing length 7.75', well depth 13.75' TOC.
- **The WCST has been updated to reflect the current well construction information measured from TOC.**

- The depth to water range provided in the prior well construction summary table (8-9' TOC) indicates a water level can be at or near the top of screen. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

- Confirm TD TOC measurement.
  - **The TD from TOC was measured at 13.09 ft on November 5, 2020.**

LN-3 ("MW-4 (1985)" permit): Installed 1985 as part of original North Landfarm permitting as MW-4 and renamed LN-3. Well record identifies 6' screen, 5.25' (aka 5' 3" casing), 11.25' TD (aka 11' 3" TD). This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. Based on 2019 gauged TD TOC (11.33' TOC), and casing AGS (0.32' – round up to 0.5') BGWPA concurs that LN-3 appears to match "MW-4" information (25-7563).

- LN-2, LN-3, LS-2, LS-3 and LS-4 were all installed at the same time. LS-2, LS-3 and LS-4 well construction, casing AGS, and gauged TD appear to indicate the well record did not reflect casing interval AGS. Therefore LN-3 casing AGS (0.32') should be added to the well record casing length and total depth TOC measurements.
  - Correct WCST: screen 5.25-11.25' BGS, 5.75-11.75' TOC, casing length 5.75', depth well BGS 11.25' BGS, depth well TOC 11.75' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- The depth to water range provided in the prior well construction summary table (5-6' TOC) indicates a water level can be at or near the top of screen. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

- Confirm TD TOC measurement.
  - **The TD from TOC was measured at 11.46 ft on November 5, 2020.**

LN-4: Well record identifies 10' screen, 4' casing, TD 14'. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. Based on other wells installed during 1985, the casing AGS (1.56') should be added to the well depth as shown in the WCST.

- Correct WCST: change casing length to 5.5', and depth of well TOC 16.5' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- The depth to water range provided in the prior well construction summary table (5.5-7.5' TOC) indicates a water level within the well casing. This needs to be considered in low flow

pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

- Confirm TD TOC measurement.
  - **The TD from TOC was measured at 14.3 ft on November 5, 2020. The monitoring well was redeveloped and regauged and TD was measured at 15.6 ft.**

LN-5: Well record identifies screen 5-15' bgs, 7-17' TOC, casing 2' AGS. 2019 gauged TD TOC 16.7' TOC, casing 2.17' AGS.
- Modify well construction summary table: Casing length 7' (not 5').
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Missing geologist boring log. Well installed October 2010.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

LN-6: Well record identifies screen 5-15' bgs, 7-17' TOC, casing 2' AGS. Geologist boring log well diagram (1-20' screen, 2.5' AGS) does not match well construction record. 2019 gauged TD TOC 11.5' TOC, and well survey casing 3.22' AGS.
- What is the screen interval from TOC based on driller and geologist well description differences?
  - Driller's record: was well set shallower (with additional casing AGS) or was casing not measured correctly at installation (3' AGS not 2' AGS) so casing length 8' (not 7')?
  - **See response below**

  - Geologist record: 1-20' bgs, casing 2.5' AGS, 3.5-23.5' TOC, casing length 3.5'.
- If assume casing longer (8', not 7') for low flow pump placement (minimum 10' TOC to be below top of screen), may not be able to sample if TD is currently 11.5' TOC. Historic water level 6-7' TOC so pump will be well below water table to be in screen interval. This needs to be considered in data evaluation.
- Confirm TD TOC measurement. Assess well construction for repair/replacement.
  - **The TD from TOC was measured at 17.65 ft on November 5, 2020. The monitoring well was redeveloped and regauged and TD was measured at 18.2 ft. Based on field measurements, the stick-up height was incorrectly noted as 2 ft and not 3 ft on the well record. In addition, the geologist well log appears to be incorrect. However, based on the well record, there is 10 feet of well screen (screen interval of 8-18 ft). Therefore, there is a sufficient screen interval for groundwater sampling purposes.**

LN-7: Well record information identifies 5-15' bgs, 7-17' TOC, casing 2' AGS. Geologist log well diagram (1-20' screen, 2.5' AGS) does not match well construction record. 2019 gauged TD TOC 17.1' TOC, and well survey casing 3.18' AGS.
- What is the screen interval from TOC based on driller and geologist well description differences?

- Driller's record: was well set shallower (with additional casing AGS) or was casing not measured correctly at installation (3' AGS not 2' AGS) so casing length 8' (not 7')?
- **See response below**

- Geologist record: 1-20' bgs, casing 2.5' AGS, 3.5-23.5' TOC, casing length 3.5'.

- If assume casing longer (8', not 7') for low flow pump placement (minimum 10' TOC to be below top of screen), pump will be well below water table to be in well screen interval. This needs to be considered in data evaluation.
- Confirm TD TOC measurement. Assess well construction.
  - **The TD from TOC was measured at 17.15 ft on November 5, 2020. Based on field measurements, the stick-up height was incorrectly noted as 2 ft and not 3 ft on the well record. In addition, the geologist well log appears to be incorrect. However, based on the well record, there is 10 feet of well screen (screen interval of 8-18 ft). Therefore, there is a sufficient screen interval for groundwater sampling purposes.**

SOUTH LANDFARM WELLS:

MW-5 through MW-6 were installed in 1985 as part of original RCRA permitting for the landfarms, and then renamed.

LS-1 ("MW-5" well permit ID): Summary table does not include LS-1 permit information. Well record states 5' screen, 4'8" casing, 9'8" total depth. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. The diagram of LS-1 (MW-5) provided with LS-1R indicates well screen set 4-9' bgs, with about 8" AGS. The well was abandoned July 1991.

- Include LS-1 information in the well construction summary table.
  - **The well has been included in the WCST.**

LS-1R: Summary table information is consistent with the well record. Well screened 4-14' BGS, 6-16' TOC, casing length 6' with casing 2' AGS, and TD 16' TOC. 2019 gauged TD TOC 15.8' TOC and well survey casing 1.83' AGS. The well record includes the LS-1 boring log.

- The depth to water range provided in the prior well construction summary table (2-3' TOC) indicates a water level within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

- Confirm if an additional boring log is available for LS-1R.
  - **The geologist boring log has been included in the Well Manual.**

LS-2 ("MW-6" well permit ID): Well record TD 10' 3" (aka 10.25'), 5' screen, 5'3" (aka 5.25') casing. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. Well survey casing stickup 1.63' AGS (round to 1.75'), 2019 gauged TD 12.05'. Well record reflects construction BGS.

- WCST reflects well construction with 1.75' casing AGS: screen 5.25-10.25' BGS, 7-12' TOC, casing length 7', well TD BGS 10.25' BGS, well TD TOC 12' TOC.

- The depth to water range provided in the prior well construction summary (1-3' TOC) indicates a water level above ground surface based on well survey casing stickup. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

- Confirm gauged well TD.
  - **The TD from TOC was measured at 12.2 ft on November 5, 2020.**

LS-3 ("MW-7" well permit ID): Well record TD 12', screen length 6', casing length 6'. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. Well survey casing stickup 0.39' AGS, and 2019 gauged TD 12.65' TOC. Well record reflects well construction BGS.

- Confirm gauged well TD.
  - **The TD from TOC was measured at 12.5 ft on November 5, 2020.**

- Since TD is deeper than current casing AGS and well construction BGS, may need to consider well as having 0.5' casing AGS originally, leading to: 6-12' BGS, 6.5-12.5' TOC, casing length 6.5', well depth BGS 12' BGS, well depth TOC 12.5' TOC.
  - Correct WCST: casing length 6.5'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- The depth to water range provided in the prior well construction summary table (1-2' TOC) indicates a water level within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.
  - **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

LS-4 ("MW-8" well permit ID): Well record TD 12', screen length 7', casing length 5'. This is an older permit – it is not always clear if "total depth" reference point is BGS or TOC. Well survey casing stickup 1.58' AGS, and 2019 gauged TD 14.14'. Well record reflects well construction BGS.

- Confirm gauged well TD.
  - **The TD from TOC was measured at 13.4 ft on November 5, 2020.**

- Since TD is deeper than current casing AGS and well construction BGS, BGWPA concurs with assuming the well had 2' AGS originally, leading to: screen 5-12' BGS, 7-14' TOC, casing length 7', well depth BGS 12' BGS and well depth TOC 14' TOC.
  - Correct WCST: casing length 7'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- The depth to water range provided in the prior well construction summary table (1-3' TOC) indicates a water level within the well casing. This needs to be considered in low flow pump intake placement and data evaluation.

- **During low flow groundwater sampling, the targeted depth of pump placement is within the saturated screen interval.**

LFR-1: Well record provided, but completion information was not included in well summary table.

- Update summary table with this well information and status.
  - **The well has been included in the WCST.**

AOC 19 (QC LAB):

MW-1 (2016) – E201607933: based on well survey casing AGS about 3':

- Correct screen interval TOC (6-16' TOC), casing length (6'), TD TOC (16'). 2019 gauged TD was 16.2' so this is close.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Missing geologist boring log. Well installed July 2016.
  - **The geologist boring log has been included in the well manual.**

MW-2 (2016) – E201607934: Missing geologist boring log. Well installed July 2016.

- **The geologist boring log has been included in the well manual.**

MW-3 (2016) – E201607935: Missing geologist boring log. Well installed July 2016.

- **The geologist boring log has been included in the well manual.**

MW-4 (2017) – E201615028: Missing geologist boring log. Well installed December 2017.

- **The geologist boring log has been included in the well manual.**

OBS-1 through OBS-4: These are the original wells installed at Hess for RCRA interim status permitting in 1981. See attached figure: page 26-27

- Work with Bureau of Water Supply and Well Permitting to resolve decommissioning documentation.
  - **The decommissioning report for OBS-1 is/was included in the well manual. The NJDEP BWAWP was contacted on June 22, 2020 regarding the remaining wells. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to obtain an Alternate Decommissioning Report.**

PERIMETER WELLS:

PER-1: Well record identifies 6' casing (3' AGS), screen length 12', screen set 3-15' BGS and 6-18' TOC. Well log/diagram says casing length 5.5' (2.5' AGS). 2019 gauged TD 17.7' TOC and well survey casing AGS 2.5.

- Confirm gauged well TD TOC.
  - **The TD from TOC was measured at 18.1 ft on November 5, 2020.**

- Well record information shown in WCST (screen 3-15' BGS, 6-18' TOC, casing length 6',

well depth BGS 15' BGS, well depth TOC 18' TOC) is more conservative for depth to top of screen for consideration in low flow sampling pump intake and data evaluation.
  - Correct WCST: depth of well TOC 18' TOC
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

PER-2DD: Well record identifies well screen 50-60' BGS with casing AGS. Well diagram states casing stickup 3' AGS. Well survey casing 2.51' AGS. 2019 gauged well depth 63.01' TOC.

- Correct WCST to the following: screen 53-63' TOC (not 50-60' TOC), casing length 53' (not 50'), and depth of Well TOC 63' TOC (not 60' TOC).
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

PER-3: Summary table information is consistent with the geologist well description (screen set 2-9' BGS, 5-12' TOC). 2019 gauged TD TOC 12.15' TOC.
- Confirm gauged well TD TOC.
  - **The TD from TOC was measured at 12.1 ft on November 5, 2020.**

PER-3D: Summary table information is consistent with the well record. Well record identifies screen 25-30' BGS with casing AGS. Well survey casing 2.64' AGS (about 3'). Screen 25-30' BGS, 28-33' TOC, casing length 28', total depth BGS 30' BGS, total depth TOC 33' TOC. 2019 gauged well TD TOC 31.3' TOC.
- Loss of 5' screen interval (currently 1.7' screen loss). Redevelopment recommended.
  - **The TD from TOC was measured at 32.25 ft on November 5, 2020. Since there is minimal screen loss, redevelopment of the monitoring well is not warranted.**

PER-4: Summary table information is consistent with the well record. Screen 3-18' BGS and TOC, flush mount well. 2019 gauged well TD TOC 15.5' TOC.
- Monitor loss of screen interval.
  - **Monitoring well PER-4 was redeveloped and the TD from TOC was measured at 15 ft on November 19, 2020, which indicates no loss of screen interval (screen interval of 3-15 ft).**

PER-5: Summary table information is consistent with the well record. Well record identifies screen 3-15' BGS and TOC, flush mount well. 2019 gauged well 13.9' TOC.
- Monitor loss of screen interval.
  - **The TD from TOC was measured at 14.14 ft on November 5, 2020, which indicates minimal loss of screen interval (screen interval of 3-15 ft).**

PER-6: Summary table information is consistent with the well record. Well record identifies screen 2-15' BGS and TOC, flush mount well.
- Resolve well decommissioning documentation with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning**

documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.

PER-6R: Well record identifies flush mount well screened 1-20' BGS. Well log/diagram identifies +2' AGS. Well survey identifies casing 1.6' AGS, and 2019 gauging TD 21.8' TOC.

- Correct WCST with casing AGS information on well log/diagram and well casing survey: screen 3-22' TOC (not 1-20' TOC); casing length 3' (not 1'), well depth TOC 22' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged well TD TOC.
  - **The TD from TOC was measured at 21.65 ft on November 5, 2020.**

PER 7 and PER-8: Summary table information is consistent with the well records. Both wells are flush mount, and top of screen is 5' BGS/TOC, and depths are 18' BGS/TOC and 17' BGS/TOC respectively. 2019 gauged TD TOC at PER-7 17.75' TOC, and PER-8 14.4' TOC.

- There may be mis-labeling of well records or geologist logs for PER-7 and PER-8 based on depth of well on well record and depth of boring on geologist boring log. The log labeled PER-8 (end of boring 19' BGS) had higher PID levels.
- 2019 gauged TD TOC at PER-8 was 14.4' TOC. Monitor screen loss.
  - **Monitoring well PER-8 was redeveloped in November. Following redevelopment, the TD from TOC of well PER-8 was measured at 15.1 ft on November 18, 2020, which indicates no screen loss (screen interval of 5.1 -15.1 ft).**

PER-9: Well record identifies screen 1-15' BGS and AGS completion. Well survey casing is 2.6' AGS (2.5' AGS based on diagram). 2018 well gauging 15' TOC.

- Correct WCST: screen 1-15' BGS, 3.5-17.5' TOC, casing length 3.5', depth BGS 15' bgs, depth TOC 17.5' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- 2018 gauged depth 15' TOC. Confirm gauged well TD TOC. Monitor well screen loss.
  - **The TD from TOC was measured at 17.25 ft on November 5, 2020, which indicates no significant screen interval loss (screen interval 3.5-17.5').**

PER-9D: Well record identifies screen 25-30' BGS and AGS completion. Well survey casing is 2.28' AGS. 2018 gauged well 37' TOC.

- No geologist boring log. Well installed September 2013. Could reference PER-9DD boring log completed to deeper depth.
  - **The geologist boring log has been included in the well manual.**

- Based on well survey casing 2.28' AGS, well record (25-30' bgs) and 2018 gauged TD 37' TOC, additional investigation of this well location is needed.
  - Confirm gauged TD TOC and well construction.

- **The TD from TOC was measured at 37 ft on November 5, 2020. Based on the geologist well log, it appears that the well record is incorrect and the monitoring well was installed to 35 feet below grade. The geologist boring log matches the construction details measured in the field.**

PER-9DD: Well record identifies screen 60-65' BGS with AGS completion. Well survey casing is 2.37' AGS and 2018 gauged well 68' TOC. Well diagram indicates different screen interval – about 56-65' BGS.

- Questions due to differences between well record (screen 60-65' bgs) and well diagram/log (longer screen interval - about 56-65' bgs?).
- Cannot confirm casing length and top of well screen. Could assume well record 5' screen interval is correct (60-65' BGS, 63-68' TOC) for determining low flow pump intake depth midpoint (65.5' TOC).
  - **To be conservative, the screen interval that matches the well record will be utilized.**

- Confirm gauged well TD TOC.
  - **The TD from TOC was measured at 67.75 ft on November 5, 2020.**

PER-10: Well record identifies screen 3-15' BGS and AGS well completion. 2019 gauged TD 19.3' TOC. Well survey casing 3.61' AGS.

- Confirm gauged well TD TOC. The well is deeper than available information would indicate. 4.5' casing? Casing length is important in confirming that the low flow pump intake depth TOC is within the screen interval. If confirmed, correct WCST: screen 3-15' BGS and 7.5-19.5' TOC, casing length 7.5', well depth BGS 15' BGS, well depth TOC 19.5' TOC.
  - **The TD from TOC was measured at 18.6 ft on November 19, 2020. The well record states that the TD of the well is 15 feet from ground surface. The well also has a 3.6 ft stick up. Therefore, the gauged well depth is consistent with the well record.**

- No geologist boring log. Well installed 2013 – reference PER-10D boring log.
  - **The geologist boring log has been included in the manual.**

PER-10D: Well record identifies 25-30' BGS and AGS completion. Well survey casing 3.2' AGS. Undated gauged well depth 32.8' TOC on prior WCST.

- Correct well summary table: screen 25-30' BGS (not 23-30' bgs – this was the gravel pack interval), 28-33' TOC (not 25-30' TOC), casing length 28' (not 25'), well depth TOC 33' TOC (not 32').
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged well TD TOC.
  - **The TD from TOC was measured at 33 ft on November 5, 2020.**

<u>COLONIAL PIPELINE WELLS</u>:

PL-1: Summary table well construction information reflected well record except for casing AGS

(screen 3-18' BGS, 5-20' TOC, casing length 5', depth bgs 18' BGS, well depth TOC 20' TOC. Decommissioning documentation and geologist boring log provided.

- Correct WCST to the following: 2' casing stickup as identified on well record (not flush mount.
  - **The WCST has been updated to reflect the information stated above.**

PL-1R: Summary table information combines well record information (screen 2.5-17.5' bgs) and flush mount diagram on geologist log. Well could also have been screened 1-19' bgs. Well could have had casing AGS.

- No decommissioning record provided. Look for the well with prior location survey and decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-2: Summary table well construction information is consistent with the well record. Well is screened 1-15' BGS, 3-17' TOC, casing length 3'.

- The 2019 TD gauging was 9.58' TOC. This indicates that the interval of the well with higher PID concentrations is no longer part of the open screen interval. Evaluate for redevelopment/repair.
  - **The TD from TOC was measured at 17 ft on November 5, 2020. Therefore, there has been no loss of screen interval.**

- The geologist log states "no bentonite used" above well screen gravel pack. Confirm that there is a concrete pad around the well.
  - **The monitoring well was completed as a stick-up well, so there is no concrete pad around the well.**

PL-3: Summary table well construction information is consistent with the well record. Well was screened 3-18' BGS and TOC as a flush mount well.

- Note PID data on geologist boring log.
- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-3R: Well record states flush mount well and geologist log identified casing +2.5 AGS. Well survey casing 2.06' AGS.

- The casing length and DTW TOC are important to establish low flow pump intake. For that reason, the casing length of 3.5' is the conservative casing length to use.
  - Correct WCST: screen 1-20' bgs, 3.5-22.5' TOC (not 3-22' TOC), casing length 3.5' (not 3'), depth of well 20' bgs, depth of well TOC 22.5' TOC.
  - **The WCST has been updated to reflect the current well construction**

information measured from TOC.

- Confirm gauged TD TOC. 2019 well gauging 19.1' TOC indicates some screen loss.
  - **The TD from TOC was measured at 21.5 ft on November 5, 2020. Therefore, there has been no significant loss of screen interval for sampling purposes. The documented well screen interval from TOC is 3.5-22.5 ft.**

PL-4: Summary table well construction is consistent with the well record. Well was screened 1-15'' BGS, 3-17' TOC, casing length 3'.

- Boring log:
  - "spoon hit something hard ~ 3.5', drilled to 4' and water came into hole – driller believes he hit a large rock…". Could this have been a wastewater/stormwater pipeline? Hole moved 3' away and well completed.
  - PID highest at 10' bgs (clay unit interface with overlying sand and gravel).
  - Evaluate piping locations in the vicinity of PL-4.
- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-4R: Well record identified flush mount well and geologist log identified casing stickup 2.5'. 2014 well survey identified 1.74' casing AGS. Assume well casing AGS 2'.

- Correct WCST to the following: screen 1-20' BGS, 3-22' TOC, casing length 3', well depth BGS 20', well depth TOC 22' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- No decommissioning record. Locate well with 2014 survey information to decommission or resolve with well permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-4RR: Well record shows 1-10' bgs well completed AGS. Well survey showed casing 3.18' AGS.

- Based on well record and well survey, correct WCST: casing length 4', and depth of well TOC 13' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Well installed 2016. No geologist log provided.
  - **The geologist boring log has been included in the well manual.**

PL-5: Summary of well construction consistent with well record except for length of casing. Screen 3-18' BGS, 5-20' TOC, casing length 5', well depth BGS 18', well depth TOC 20'.

- Correct WCST to the following: casing length 5'.
  - **The WCST has been updated to reflect the information stated above.**

- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-5R: No geologist log. Well installed 2016.

- **The geologist boring log has been included in the well manual.**

PL-6: Summary of well construction information is consistent with well record except for length of casing and well completion AGS. Screen set 2-14' BGS, 4-16' TOC, casing length 4'.

- Correct well construction table: +2' AGS (not flush mount).
  - **The WCST has been updated to reflect the information stated above.**
- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-6R: Well record and geologist log/diagram identify screen set 1-20' BGS. Well record states flush mount well, geologist log identified casing +2.5 AGS. Well survey casing 1.56' AGS. 2019 gauged TD 21.65' TOC.

- Correct WCST with casing 2.5' AGS based on geologist log description and documented casing AGS: screen 3.5-22.5' TOC, casing length 3.5', depth of well TOC 22.5' TOC.
  - **The WCST has been updated to reflect the information stated above.**

- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-6RR: Well record identifies screen 2-15' BGS and TOC as a flush mount well.

- Add PL-6RR construction and survey information to the summary table.
  - **Monitoring well PL-6RR has been added to the WCST.**

- No geologist log provided. Well installed January 2020.

- **The geologist boring log has been included in the well manual.**

PL-7: Summary table well construction information is consistent with the well record. Screen set 3-18' BGS, 5-20' TOC, casing length 5', well depth BGS 18', well depth TOC 20'. Well survey casing 2.23' AGS, and 2019 gauged well TD 21.75' TOC.

- Confirm TD TOC. 2019 gauged TD 21.75' TOC deeper than it should be. This could change casing length for low flow sample pump intake depth TOC.
  - **Monitoring well PL-7 has been recently damaged and could not be gauged. An evaluation on whether the monitoring well can be repaired or needs to be replaced is currently being conducted.**

PL-8: Summary table well construction information is consistent with the well record. Screen set 3-18' BGS, 5-20' TOC, casing length 5', well depth BGS 18', well depth TOC 20'.

- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-8R: Well record states flush mount well, geologist log identified casing +2.5 AGS. Well survey casing 1.62' AGS. Well screened 1-20' bgs. 2019 gauged well depth 19.5' TOC.

- Correct WCST with 2.5' AGS (most conservative for low flow sampling plan): screen 3.5-22.5' TOC, casing 1.62' AGS (not flush mount), casing length 3.5', depth of well TOC 22.5' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged TD TOC. Well is gauging deeper than it should be which would mean greater casing length.
  - **The TD from TOC was measured at 21.7 ft on November 5, 2020. This measurement is consistent with the well construction details summarized above.**

PL-9: Well summary information consistent with well record except for casing AGS. Screen set 2-17' BGS, 4-19' TOC, casing 2' AGS, casing length 4', well depth BGS 17', well depth TOC 19.

- Correct WCST: 2' casing AGS (not flush mount).
  - **The WCST has been updated to reflect the information stated above.**

- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

PL-9R: Well record states flush mount well, geologist log identified casing +2.5 AGS. Well screened 1-20' BGS, well survey casing 1.37' AGS. 2019 gauged TD 23.25' TOC.

- Correct well WCST with 2.5' AGS (most conservative for low flow sampling plan): screen 3.5-22.5' TOC (not 1-20' TOC), survey casing stickup 1.37' (not flush mount), casing length 3.5' (not 1'), depth of well TOC 22.5' TOC.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Confirm gauged TD TOC. Well is gauging deeper than it should be which would mean greater casing length.
  - **The TD from TOC was measured at 22.25 ft on November 5, 2020. This measurement is consistent with the well construction details summarized above.**

OFF SITE WELLS:

SC-1: No geologist log. Installed October 2019.

- **The geologist boring log has been included in the well manual.**

SC-1D: Summary table well construction information is consistent with the well record. Well screened 20-30' BGS and TOC as flush mount well. Undated gauged TD 33.4' TOC.

- Gauged TD is **not** consistent with well construction. Confirm gauged well TD TOC. Evaluate well construction.
  - **Due to site access issues, the off-site monitoring wells could not be gauged in November 2020. The monitoring wells will be gauged as part of the annual groundwater sampling event in December 2020 and well construction information will be evaluated at that time.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-1DD: Summary table well construction information is consistent with the well record. Well screened 50-60' BGS and TOC as a flush mount well. Undated gauged TD 63.3' TOC.

- Gauged TD is **not** consistent with well construction. Confirm gauged well TD TOC. Evaluate well construction.
  - **Due to site access issues, the off-site monitoring wells could not be gauged in November 2020. The monitoring wells will be gauged as part of the annual groundwater sampling event in December 2020 and well construction information will be evaluated at that time.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-2: No geologist log provided. Installed October 2019.

- **The geologist boring log has been included in the well manual.**

SC-2D: No geologist log provided. Installed October 2019.

- **The geologist boring log has been included in the well manual.**

SC-2DD: Summary table well construction information is consistent with the well record. Well screened 50-60' BGS and TOC as a flush mount well. Undated gauged TD 61.8' TOC.

- Gauged TD is **not** consistent with well construction. Confirm gauged well TD TOC. Evaluate well construction.
  - **Due to site access issues, the off-site monitoring wells could not be gauged in November 2020. The monitoring wells will be gauged as part of the annual groundwater sampling event in December 2020 and well construction information will be evaluated at that time.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-2DDD: Summary table well construction information is consistent with the well record. Well screened 68-78' BGS and TOC as a flush mount well. Undated gauged TD 79.4' TOC.

- Gauged TD is **not** consistent with well construction. Confirm gauged well TD TOC. Evaluate well construction.
  - **Due to site access issues, the off-site monitoring wells could not be gauged in November 2020. The monitoring wells will be gauged as part of the annual groundwater sampling event in December 2020 and well construction information will be evaluated at that time.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-3: Summary table well construction information is consistent with the well record except for casing length. Well screened 4-14' BGS, 7-17' TOC, casing length 7', well depth BGS 14', well depth TOC 17'. Undated gauged TD 14.34' TOC and casing 2.95' AGS.

- Correct WCST: casing length 7'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- Gauged TD **not** consistent with well construction. Confirm gauged well TD TOC. Evaluate well construction, blockage, silting, etc.
  - **Due to site access issues, the off-site monitoring wells could not be gauged in November 2020. The monitoring wells will be gauged as part of the annual groundwater sampling event in December 2020 and well construction information will be evaluated at that time.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-3D: Summary table well construction information is consistent with the well record except for screen length and casing length. Well screened 25-35' BGS, 28-38' TOC, casing length 28', well depth BGS 35', and well depth TOC 38'. The undated gauged TD 37.9' TOC is

consistent with well construction. Well survey casing 2.58' AGS.

- Correct WCST: screen length 10' (not 25'), casing length to 28' (not 25').
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-3DD: Summary table well construction information is consistent with the well record except for casing length. Well screened 55-65' BGS, 58-68' TOC, casing length 58', well depth BGS 65', well depth TOC 68'. Well survey casing 2.94' AGS. Undated gauged TD 68.1' TOC is consistent with well construction.

- Correct WCST: casing length to 58'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-3DDD: Summary table well construction information is consistent with the well record except for casing length. Well screened 71-81' BGS, 74-84' TOC, casing length 74', well depth BGS 81', well depth TOC 84'. Well survey casing 2.95' AGS. Undated gauged TD 84.4' TOC is consistent with well construction.

- Correct WCST: casing length 74'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

- No geologist log provided. Installed October 2019.
  - **The geologist boring log has been included in the well manual.**

SC-4: No geologist log provided. Installed October 2019.

- **The geologist boring log has been included in the well manual.**

SC-4D: No geologist log provided. Installed October 2019.

- **The geologist boring log has been included in the well manual.**

SC-4DD: No geologist log provided. Installed October 2019.

- **The geologist boring log has been included in the well manual.**

<u>TANK FIELD WELLS</u>:

SM-1: Well record screen interval is different from well diagram. Well record is reflected in WCST.

- Resolve well construction screen interval – 5-15' bgs or 2-15' bgs.
  - **The information from the well record will be used when determining pump placement during groundwater sampling.**

- Unless resolved, low flow sampling must consider longest casing length and DTW so pump intake is not in well casing and is adequately below top of screen.
  - **See above response**

TF-1: Well record information: 1-11' bgs, +1 AGS, well survey 1.61 AGS, 2-12' TOC. 2019 gauged TD 11.8' TOC. Well likely set shallower than 11' bgs based on additional casing AGS.

- No geologist log or well diagram. Installed February 1990. Check CMP.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed in order to locate the log.**

- Correct WCST: casing length 2', well depth BGS 11', well depth TOC 12'.
  - **The WCST has been updated to reflect the information summarized above.**

TF-2: Well record information: 1-11' bgs, +1 AGS (+2 crossed out), survey 0.63' AGS, 2019 gauged TD 11.75' TOC.

- No geologist log or well diagram. Installed February 1990. Check CMP.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed in order to locate the log.**

- Correct WCST: casing length 2', well depth BGS 11', well depth TOC 12'.
  - **The WCST has been updated to reflect the information summarize above.**

TF-3: Well record information: 1-11' bgs, +1 AGS, survey 1.26' AGS, 2019 gauged TD 11.68' TOC. Well likely set shallower than 11' bgs based on additional casing AGS.

- No geologist log or well diagram. Installed February 1990. Check CMP.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

- Correct WCST: casing length 2', well depth BGS 11', well depth TOC 12'.
  - **The WCST has been updated to reflect the information summarized above.**

<u>MARINE TERMINAL AREA WELLS</u>:

TL-1: Summary table well construction information is consistent with the well record except for DTB from TOC. Well record information: 2-14' BGS and TOC as a flush mount well. Undated gauged TD 13.75' TOC.

- Correct WCST: DTB from TOC 14' TOC based on well construction.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

TL-2: Summary table well construction information is consistent with the well record except for DTB from TOC. Well record information: 2-15' BGS and TOC as a flush mount well. Undated gauged TD 14.4' TOC.

- Correct WCST: DTB from TOC 15' TOC based on well construction.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**

TM-WELLS:

TM-1: Summary table well construction information is consistent with the well record except for DTB from TOC. Well record information: 3-18' bgs, casing +2.5 AGS, 5.5-20.5' TOC. Well survey casing 3.1' AGS, and undated gauged TD 19.4' TOC.

- Correct WCST: based on well construction, DTB from TOC is 20.5' TOC. Well was probably set shallower in borehole resulting in more casing ASG (3.1' AGS rather than 2.5' AGS). The gauged TD of well TOC is slightly shallower than the well construction well depth TOC of 20.5'.
  - **The WCST has been updated to reflect the current well construction information measured from TOC.**
- Confirm TD TOC.
  - **The TD from TOC was measured at 20.5 ft on November 5, 2020.**
- No geologist log provided for well installed December 1998.
  - **The geologist boring log has been included in the well manual.**

TM-2: No geologist log provided for well installed December 1998.

- **The geologist boring log has been included in the well manual.**

TM-3: Summary table well construction information is consistent with the well record except for DTB from TOC. Well record information: 3-18' bgs, casing +2.5' AGS, 5.5-20.5' TOC. Well survey casing 3.12' AGS, and undated gauged TD 20.9' TOC.

- Confirm gauged well depth TOC to confirm casing length and top of screen from TOC.
  - If gauged TD TOC is 20.5' or less, correct WCST to show DTB from TOC is 20.5' TOC and conclude that well was likely set shallower in borehole resulting in more casing AGS (3.12' AGS rather than 2.5' AGS).
  - **The TD from TOC was measured at 20.15 ft on November 5, 2020. The WCST has been updated to reflect the current well construction information measured from TOC.**
  - If gauged TD TOC is greater than 20.5', need to assume additional casing was used and reflect this in well construction summary table.
  - **See above response**
- No geologist log provided for well installed December 1998.
  - **The geologist boring log has been included in the well manual.**

TM-4: No geologist log provided for well installed December 1998.

- **The geologist boring log has been included in the well manual.**

TM-5: Summary table well construction information is consistent with the well record except for DTB form TOC. Well record information: screen set 3-18' bgs, casing +2.5' AGS, 5.5-20.5' TOC. Well survey casing 2.52' AGS, and undated gauged TD 22.1' TOC.

- Confirm gauged well depth TOC to confirm casing length and top of screen from TOC.
  - If gauged TD TOC is confirmed greater than 20.5', need to assume additional casing

was used and reflect this in well construction summary table.
    - **The TD from TOC was measured at 20.5 ft on November 5, 2020.**

- No geologist log for well installed December 1998.
    - **The geologist boring log has been included in the well manual.**

TM-6: Summary table well construction information is consistent with the well record. Well record information: 3-18' bgs, casing +2.5' AGS, 5.5-20.5' TOC. Well survey casing 3.5' AGS, prior field gauged TD not available.

- No geologist log provided for well installed December 1998.
    - **The geologist boring log has been included in the well manual.**

- No decommissioning record. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.
    - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

TM-6R: Summary table well construction information is consistent with the well record. Well record information: 3-18' bgs, finished AGS (not specific on well record or geologist log/well diagram). Well survey casing 2.19' AGS, and undated gauged TD 19.90' TOC.

- Correct WCST: casing length 5'.
    - **The WCST has been updated to reflect the current well construction information measured from TOC.**

TM-7: No geologist log provided for well installed December 1998.

- **The geologist boring log has been included in the well manual.**

<u>TRUCK LOADING RACK WELLS</u>:

CMP Figure 11.1 identifies how original MW-1 through MW-4 were renamed: TR-1 (old MW- 3), TR-2 (old MW-1), TR-3 (old MW-4) and TR-4 (old MW-2).

TR-1: TR-1 was identified as "old MW-3".

- Correct the well record (MW-3) associated with the TR-1 well.
    - **The well record for well TR-1 has been corrected.**
- Based on the MW-3 well record: well screened 7-22' bgs and completed as a flush mount well.
- MW-3 geologist log in the CMP should be included with the TR-1 location information.
    - **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

- No decommissioning record was provided. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.

- **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

TR-1R:

- Well record information: 2-16' bgs, completed as a flush mount well. Geologist log and well diagram screen 4-18' bgs, completed as a flush mount well. Undated gauged TD 16' TOC.
  - Confirm well TD TOC.
  - **The TD from TOC was measured at 18 ft on November 5, 2020.**

  - Need to resolve casing length to make sure low flow sample pump intake is not within well casing or too close to top of screen.
  - **To be conservative, the assumed screen interval is 4-18 ft from TOC. The WCST has been revised to reflect this information.**

TR-2: TR-2 was identified as "old MW-1".

- Correct the well record (MW-1) associated with the TR-2 well.
  - **The well record for well TR-2 has been corrected.**

- Based on the MW-1 well record: well screened 7-22' bgs and completed as a flush mount well.
- MW-1 geologist log in the CMP should be included with the TR-2 location information.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

- No decommissioning record provided. Locate well with survey information to decommission or resolve with well permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

TR-2R: Well record information: 1-20' bgs, flush mount. Geologist log identified casing stickup 2.5' AGS. Well survey reflects flush mount well. Undated gauged TD 20' TOC.

- Correct WCST: screen length 19'.
  - **The WCST has been revised to reflect the correct screen length.**

TR-3: TR-3 was identified as "old MW-4".

- Correct the well record (MW-4) associated with the TR-3 well.
  - **The well record for well TR-3 has been corrected.**

- Based on the MW-4 well record: well screened 7-17' bgs and completed as a flush mount well.
- MW-4 geologist log in the CMP should be included with the TR-3 location information.

- **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

- No decommissioning record provided. Locate well with survey information to decommission or resolve with well permitting.
  - **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

TR-3R: No decommissioning record provided. Locate well with survey information to decommission or resolve with Bureau of Water Supply and Well Permitting.

- **The NJDEP BWAWP was initially contacted on June 22, 2020 with an Individual Well Search Questionnaire. BWAWP responded that no decommissioning documentation was on file. Earth Systems is working with the NJDEP BWAWP to determine how to obtain an Alternate Decommissioning Report.**

TR-4: TR-4 was identified as "old MW-2".

- Correct the well record (MW-2) associated with the TR-4 well.
  - **The well record for well TR-4 has been corrected.**

- Based on the MW-2 well record: well screened 7-22' bgs and completed as a flush mount well.
- MW-2 geologist log in the CMP should be included with the TR-4 location information.
  - **The geologist boring log could not be located. Historic reports will continue to be reviewed to attempt to locate the log.**

TR-4R:

- E201207156 (not E201207517);
  - Correct well permit ID and information in well summary table. Information and permit number on the TR-4R line is for TR-4D.
  - **The WCST has been revised to reflect the correct permit number for well TR-4R.**

- TR-4R well record information: 1-15' bgs, flush mount well.

TR-4D:

- E201207157 (not E2021207516);
  - Correct well permit ID and information in well summary table. Information and permit number of the TR-4D line is for TR-4R.
  - **The WCST has been revised to reflect the correct permit number for well TR-4D.**

- TR-4D well record information: 25-30' bgs, flush mount well. Well diagram/geologist boring log reflects boring TD 30' bgs, and well screen interval 20-25' bgs. Undated gauged well TD 24.3' TOC. Well appears to be completed 20-25' bgs. Confirm gauged well TD

TOC.

- **Monitoring well TR-4D was redeveloped in November. Following redevelopment, the TD from TOC was measured at 29.3 ft on November 19, 2020. The well screen interval is from 25-30 ft as measured from TOC. This measurement is consistent with the well record.**

TR-4DD: Well record information: 51-56' bgs, flush mount well, and undated gauged well TD 57.2' TOC.

- Confirm gauged TD TOC. If gauging continues to reflect depth deeper than 56' BGS, will need to reevaluate casing length. The borehole was deeper than 56'.
  - **The TD from TOC was measured at 56.32 ft on November 5, 2020. This measurement is consistent with the well record.**

TR-5: Well record information: 2-12' bgs, flush mount well. Geologist log/well diagram identifies well screen 1-20' bgs and flush mount well. Undated gauged well TD 10.65' TOC.

- Correct WCST: well screen 2-12' bgs; 2-12' TOC.
  - **See response below**

- Confirm gauged well TD TOC to confirm 2-12' bgs construction
  - **The TD from TOC was measured at 11.5 ft on November 5, 2020. This measurement is consistent with the well record.**

TR-5D: Summary table well construction information is consistent with the well record. Well record information: 15-25' bgs, flush mount well. Undated gauged well TD 22.5' TOC.

- Confirm gauged well TD TOC.
  - **The TD from TOC was measured at 23.2 ft on November 18, 2020, after the monitoring well was redeveloped. This indicates some screen loss. However, there is still sufficient screen present for groundwater sampling (Screen of 15-25 ft from TOC).**

TR-6: Summary table well construction information is consistent with the well record. Well record information: 2-12' bgs, flush mount well. Geologist log/well diagram identifies screen interval 1-20' bgs, flush mount well. Undated gauged well TD 12.7' TOC.

- Confirm gauged well TD TOC to confirm 2-12' bgs construction.
  - **The TD from TOC was measured at 12 ft on November 5, 2020. This measurement is consistent with the well record.**

TR-6D: Summary table well construction information is consistent with the well record and well diagram/geologist log except for DTB from TOC. Well record information: 25-30' bgs, flush mount well. Undated gauged well TD 23.65' TOC.

- Explain DTB from TOC measurement of 28.3' TOC.
  - **The TD from TOC was measured at 29.9 ft on November 5, 2020. This measurement is consistent with the well record and indicates no loss of screen interval.**

- Confirm gauged well TD TOC to resolve question of well completion and prior gauging data (23.65’ TOC). If there is a blockage in the well, or different construction, this needs to be resolved.
  - **See response above**

- This is only a 5’ screen. If DTB from TOC 28.3’ was a gauged depth (not construction depth), this is 1.7’ of screen loss. Any screen interval reduction is a concern to pump placement for sampling.
  - **See response above**